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TAXONOMICAL STUDY OF SOCIAL VESPIDAE AT HUTAN SIMPAN UiTM JENGKA, PAHANG

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ABSTRACT

A taxonomy study of social Vespidae family was conducted at Hutan Simpan UiTM Jengka Kem Sri Gading, situated in Pahang Darul Makmur. The objective was to provide an illustrated key for social Vespidae species. The study was conducted from November 2013 until April 2014 by setting up several Malaise traps along the transect lines and the trapped insect were collected once a month. Six traps were used in this study. A total of 286 individuals that belong to Order Tiphiidae, Braconidae, Formicidae, Bethylidae, pompilidae, Ampulicidae, Apidae, Thynnide, Evaniidae, Pelecinidae, Rhopalosomatidae, and Gasteruptidae, has been collected. Thirteen individuals were from subfamily Polistinae, 3 from subfamily Vespinae, and one was from subfamily Stenogastrinae. Six species were identified in which 8 individuals were *Parabolybia nodosa*, 3 individuals *Ropalidia fasciata*, 2 individuals of *Polistes jokahamae* and *Vespula flaviceps* respectively and 1 each for *Vespa tropica* and *Eustenogaster nigra.*

Key words: Hymenoptera, social wasp (vespidae), malaise trap, *Parabolybia nodosa, Ropalidia fasciata, Polistes jokahamae, Vespula flaviceps, Vespa tropica* and *Eustenogaster nigra*

INTRODUCTION

Taxonomy is the science of naming, describing and classifying organisms that includes all the life in the world. Using morphological, behavioural, genetic, and biochemical observations, taxonomists identify, describe and arrange species into classifications, including the new and the unknown organism (Secretariat of Convention on Biological Diversity, 2007). Taxonomy is not only a glorified form of filing-with each species in its prescribed place in an album. Gould (1989) claimed that taxonomy is also a dynamic and fundamental science, dedicated to explore the reasons of relationships and similarities among organisms (Gould, 1998).

Classifications are theories about the basis of natural order, not dull catalogues compiled only to avoid chaos (Gould, 1998). Approximately, one million named species and perhaps several times that number unnamed, insects account for a great majority of the species of animals on earth (Myers, 2013). Class Insecta of Phylum Arthropoda has undergone and continues to undergo changes in its classification. From 26 orders listed by Johnson and Triplehorn (2005), new orders were found, where more than 30 orders of insects in current usage sorted alphabetically are listed such; Blattodea, Coleoptera, Collembola, Dermaptera, Diplura, Diptera, Embioptera, Embiidina, Ephemeroptera, Grylloblattodea, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Mantodea, Mantophasmatodea, Mallophaga, Mecoptera, Neuroptera, Odonata, Orthoptera, Phasmatodea, Phthiraptera, Plecoptera, Protura, Psocoptera, Siphonaptera, Siphunculata, Strepsiptera, Thysanoptera, Thysanura, Trichoptera and Zoraptera (Goulet and Huber, 1993).

Some of them, like ant or moth, are familiar to everyone, but others are more obscure (EOL, 2013). The focus of this study, which is social Vespidae, falls under superfamily Vespoidea from the Aculeates that lies under the suborder Apocrita. Three social subfamilies are; Polistinae, Vespinae & Stenogastrinea (Brothers. and Finnamore, 1993).

MATERIALS AND METHOD

Chemicals and raw materials

The chemical used was 70% alcohol and the raw materials used in this study were the insects

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collected from the sampling site at Kem Sri Gading, Hutan Simpan UiTM Jengka, Pahang, Malaysia.

Sampling Area

This study was conducted at Kem Sri Gading, Hutan Simpan UiTM Jengka located in Pahang. The sampling area was divided into two transect line; forest fringe and inner forest. Study was conducted from November 2013 until April 2014.

Sample Collection

Malaise trap with collecting jar was half-filled with alcohol 70 %. Alcohol solution is used to kill the insects after they move up in the net and enter the alcohol solution. Mainly, the alcohols act as a preservative in the collecting chamber so that sample will be preserved. Samples were collected from each trap every month for four month. In every collection of samples, collecting jars were replaced with a new one.

Mounting and Preservation

After collection of samples, insects were sorted, preserved, pinned accordingly, so that the samples will be intact. Sorting process was done based on the morphology and physical characteristics and then grouped into their family. Then, sorted samples were pinned vertically using stainless steel insects pinned which varied in size. Samples were left for drying process for a week in the oven. Optimal temperature for drying purpose is around 40ºC.The aim of drying is to prevent fungal or animal attack. Lastly, the specimen was transferred into insect's box.

Family Identification

Dry specimen undergo identification process by comparing the morphology of the specimen with the keys provided in "Hymenoptera of the World: An Identification Guide to Families" book. For further confirmation of the specimen, samples were identified by comparing them with insects' collection available at Centre of Insects Systematic, Faculty of Science and Technology, University Kebangsaan Malaysia (UKM).

Illustrated Keys of Species

Identified species under the social Vespidae were then illustrated based on their morphology.

RESULTS AND DISCUSSION

Table 1 shows the abundance of species under Vespidae family at hutan Simpan UiTM Jengka, Pahang. The list includes the subfamily Eumeninae which is solitary Vespidae. A total of 19 individual of Vespidae comprised of 6.64% were collected in this study. The insects collected were identified within the subfamily Stenogastrinae, Polistinae, Vespinae and Eumeninae. The other two subfamily; namely Euparaginae and Masarinae, were not collected. Subfamily Polistinae showed the highest number of morphospecies compared to the other subfamily with three morphospecies, followed by Vespinae and Stenogastrinae, both with two morphospecies. On the other hand, subfamily Stenogastrinae recorded the least only one morphospecies. As represented by their term; morphospecies, all the species identified were differed by their morphology.

Family Identification

Table 2 shows the species that had been identified and categorized into their respective genus and species. Specimens of Eumeninae are typically not as numerous as those of the social groups (Carpenter and Nguyen, 2003). From the 19 individuals collected, two were excluded as they were from solitary species of Eumeninae family. Thus, species identification was carried out towards the 17 individuals with 6 different morphospecies using the previous stated keys.

Species Identification: Key to Subfamilies of Social Vespidae

Identification of species was done using two methods; directly with detailed photography of each species, and indirectly with the aids of the keys. A key composed of a couplet, where this couplet is arranged in contrasting pairs of statement. The key is designed for Vespidae family. The couplets definitions and the illustrations are taken from the reference publication "Hymenoptera of the world: An Identification guide to families" (Goulet and Huber, 1993) as showed in Fig. 2, 3 and 4.

Table 1. Abundance of species under Vespidae family at Hutan Simpan UiTM Jengka, Pahang

Subfamily	Morphospecies	Total Individual
Polistinae	Sp 1	8
	Sp 2	3
	Sp 3	2
Vespinae	Sp 4	2
	Sp 5	1
Stenogastrinae	Sp 6	1
Eumeninae	Sp 7	1
	Sp 8	1
Total individual		19

Table 2. Identified species of insects at Hutan Simpan UiTM Jengka

Subfamily	Genus	Species	Total
Polistinae	*Parapolybia*	*nodosa*	8
	Ropalidia	*fasciata*	3
	Polistes	*jokahamae*	2
Vespinae	*Vespula*	*flaviceps*	2
	Vespa	*tropica*	1
Stenogastrinae	*Eustenogaster*	*nigra*	1
Total			17

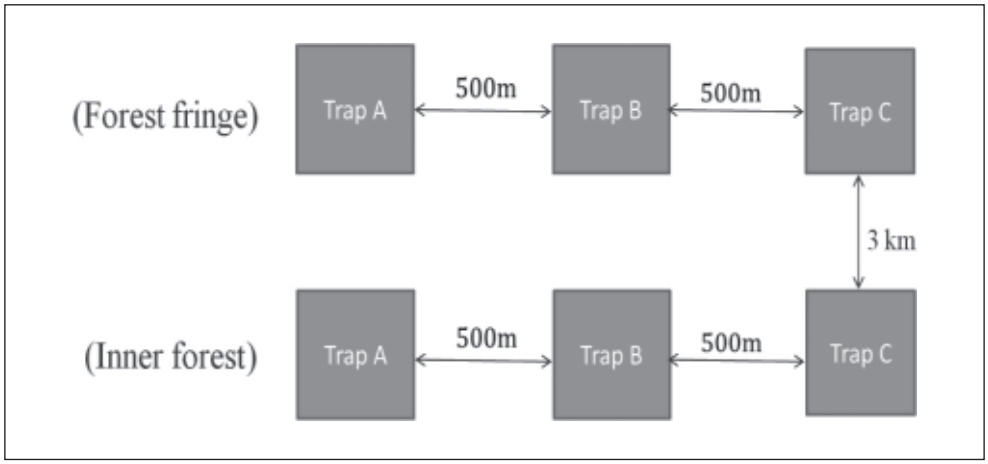

Fig. 1. Arrangement of Malaise traps (unscale).

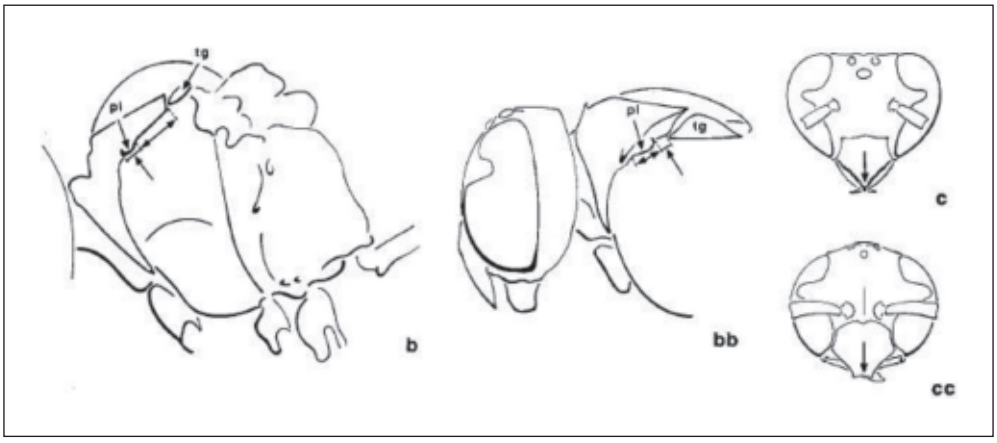

Fig. 2.

a. Fore wing not longitudinally folded at rest, not reaching beyond metasomal segment 3.
b. Pronotal lobe (pl) separated from tegula (tg) by a distance greater than the length of lobe.
c. Clypeus projecting and acute or narrowly rounded ventrally. ---------- **Stenogastrinae**
aa. Fore wing longitudinally folded at rest, usually reaching at least to posterior margin of metasomal segment 4.
bb. Pronotal lobe (pl) usually separated from tegula (tg) by a distance equal to or less than the length of lobe, but distance rarely greater.
cc. Clypeus usually not projecting, neither acute nor narrowly rounded ventrally, but sometimes projecting and acute or narrowly rounded. ---------- **2.**

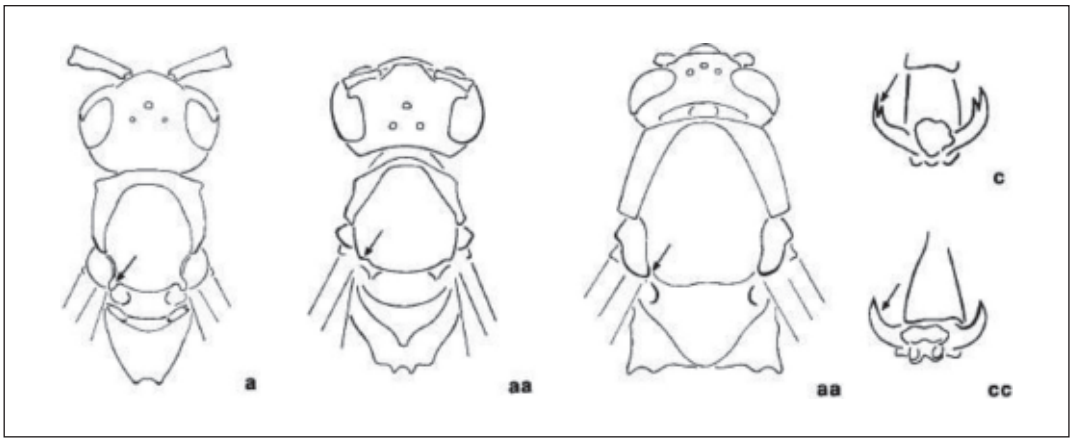

Fig. 3.

2(1) a. Mesoscutum with parategula (lobe projecting backward from posterolateral apex).
b. Posterior lingual plate longer than wide.
c. Tarsal claws usually cleft, but rarely simple and smooth ventrally.
d. Solitary or subsocial. ---------- **Eumeninae (outside the scope of study)**
aa. Mesoscutum without parategula.
bb. Poeterior lingual plate as long as wide.
cc. Tarsal claws and smooth ventrally.
dd. Eusocial. ---------- **3.**

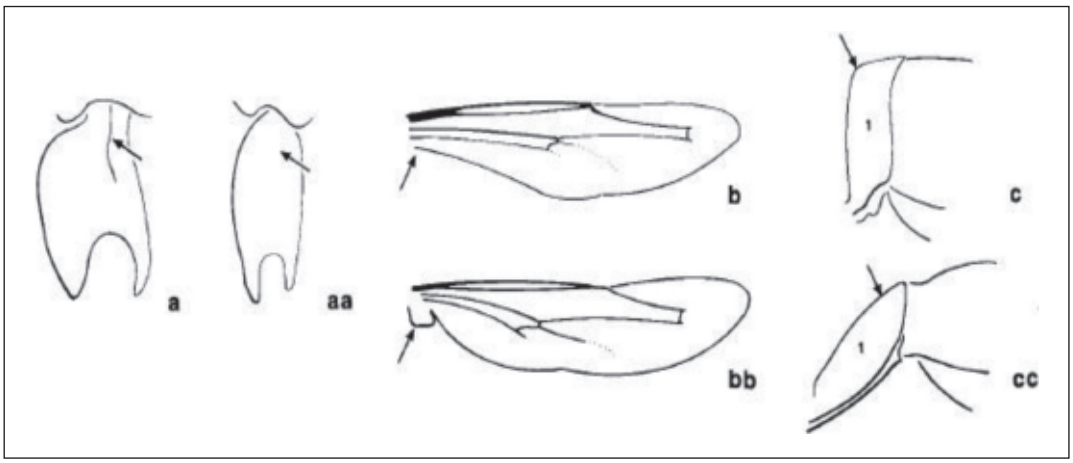

Fig. 4.

3(2) a. Metacoxa with dorsal longitudinal carina.
b. Hind wing without jugal lobe.
c. Metasoma sessile; tergum 1 abruptly declivous anteriorly. ---------- **Vespinae**
aa. Metacoxa smooth dorsally.
bb. Hind wing usually with jugal lobe, but sometimes without.
cc. Metasoma more or less sessile or petiolete; tergum 1 gradually declivous anteriorly. ----- **Polistinae**

CONCLUSIONS

With 17 out of 286 individual insects, social Vespidae family covered up to 5.94 percent of the total insects from order Hymenoptera collected. This percentage represents the abundance of social Vespidae family at the Hutan Simpan UiTM Jengka. On the other hand, within the family, with 13 insect collected, the subfamily Polistinae was much more abundant compared to Vespinae and Stenogastrinae which recorded three and one individual insect respectively. Use of different technique to collect specimen of interest will help to gather more specimen. Each species can also be studied and described succinctly in term of their geographic distribution, diet, colony size, nest and habitat so that more information can be documented. Documentation of this information will helps us to understand their niches, thus provide future reference to others on those species.

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